

Black Hawk UH-60M Baseline and UH-60M Upgrade

Executive Summary

- As of September 2009, 140 UH-60M Baseline aircraft are fielded. Early reports from units receiving the UH-60M Baseline are encouraging and confirm DOT&E's assessment based on operational test results that the UH-60M Baseline is effective, suitable, and survivable.
- The UH-60M Upgrade Common Avionics Architecture System (CAAS) provided enhanced navigation and situational awareness while reducing crew workload during a Limited User Test (LUT). The CAAS provides additional features over the legacy UH-60A/L cockpit. UH-60M Upgrade CAAS capabilities and workload are similar to the UH-60M Baseline digital cockpit.
- The full UH-60M Upgrade fly-by-wire flight control system is still in development and has not yet been flown in operational testing.
- The composite tailcone redesign efforts did not meet weight, cost, or survivability goals of the program. The Army decided to stop redesign efforts and revert to the proven metal tailcone design.
- In August 2009, the Army proposed to continue UH-60M Baseline production and not pursue production of the UH-60M Upgrade configuration. The Army will complete developmental testing of UH-60M Upgrade technology. The Army also proposed to integrate selected capabilities onto the UH-60M Baseline aircraft.
- A revised Acquisition Strategy and Test and Evaluation Master Plan are required due to program changes.

System

- The UH-60M Baseline and UH-60M Upgrade are modernized versions of the UH-60A or UH-60L Black Hawk medium-lift helicopters.
- An Assault Helicopter Battalion is organized as three companies of 10 aircraft each.
- The acquisition objective is for 1,931 UH-60 Black Hawks (1,227 UH-60M variants and 704 UH-60L variants). Until recently, the program projected that 361 aircraft would be UH-60M Baseline aircraft, and the remaining 866 would be UH-60M Upgrade aircraft.
- The UH-60M Baseline aircraft include the following capabilities:
 - Digital cockpit with Blue Force Tracker (Friendly force tracking)
 - Power and airframe improvements with the 701D engine, wide chord blades for enhanced performance, and



- monolithic machined parts that provide structural improvement over the UH-60A and UH-60L
- Improved survivability with enhanced laser and missile warning systems and infrared signature suppression for anti-aircraft missile defense
- The UH-60M Upgrade design adds the following:
 - Fly-by-wire advanced flight controls
 - A CAAS and networked digital connectivity for enhanced commonality with other Army aircraft
 - Improved handling qualities optimized for minimum pilot workload and increased safety in degraded visual environments
 - Full Authority Digital Engine Control (FADEC) for the 701E engine

Mission

Assault Aviation and General Support Aviation Battalions will employ the Black Hawk helicopter to conduct the following missions:

- Air Assault lift for 11 combat Soldiers or 9,000 pounds of equipment for mobile strike and counter mobility operations
- Sustainment Operations to resupply the force through internal and external cargo lift capability
- Casualty and medical evacuation
- Command and control

Prime Contractor

- Sikorsky Helicopter, West Palm Beach, Florida, and Stratford, Connecticut

ARMY PROGRAMS

Activity

- As of September 2009, 140 UH-60M Baseline aircraft were fielded.
 - The Army conducted a LUT of the UH-60M Upgrade CAAS in October 2008 using a cockpit simulator in the System Integration Laboratory at Redstone Arsenal, Alabama.
 - In December 2008, the Army proposed delaying the UH-60M Upgrade low-rate initial production cut-in decision one year. The delay was intended to facilitate the production of 22 additional HH-60M MEDEVAC helicopters and six additional UH-60M helicopters and to allow time to complete planned flight testing prior to a low-rate initial production decision. The delay occurred as a result of a nine month slip in the delivery of test aircraft.
 - Initial LFT&E on the new main rotor and tail rotor actuators indicated ballistic vulnerability and necessitated additional design changes and ballistic qualification.
 - Initial LFT&E on the new composite tailcone indicated significant ballistic vulnerability and necessitated a redesign. The composite tailcone redesign efforts did not meet weight, cost, or survivability goals of the program. The Army chose to revert to the proven metal tailcone design.
 - A combined contractor and government test team continued developmental flight testing on two prototype UH-60M Upgrade aircraft. Testing focused on the fly-by-wire advanced flight controls, CAAS cockpit integration, and FADEC engine development. As of September 2009, 190 of the planned 407 developmental flight hours had been completed.
 - In August 2009, the Army proposed to continue UH-60M Baseline production and not pursue production of the UH-60M Upgrade configuration. The Army intends to complete developmental testing of UH-60M Upgrade technology. The Army also proposed to integrate selected capabilities onto the UH-60M Baseline aircraft.
- improvement over the UH-60A/L cockpit. UH-60M Upgrade CAAS capabilities and workload were similar to those of the UH-60M Baseline digital cockpit.
- Fly-by-wire software is not mature. Software anomalies during take-off, landing, flight close to the terrain, and aggressive maneuvers negatively impacted, to varying degrees, 14 of the 16 successful missions.
 - Fly-by-wire technology, as implemented in the LUT, reduced pilot workload and fatigue during flight at altitude, but increased aircrew workload during low altitude/low airspeed maneuvers.
- Full UH-60M Upgrade fly-by-wire functionality has not yet been proven in developmental flight testing. Prototype aircraft are not yet ready to participate in integrated operational testing.
 - Redesign and qualification of the main rotor and tail rotor actuators is required as a result of ballistic testing.
 - The UH-60M Baseline effort to assess vulnerability of the new monolithic frames and the laboratory simulation testing to evaluate ballistic damage effects on the fly-by-wire computer system have not been completed.

Recommendations

- Status of Previous Recommendations. The Army has addressed eight of the 14 recommendations included in the May 2007 DOT&E combined OT&E and LFT&E Report for the UH-60M Baseline aircraft.
- FY09 Recommendations.
 1. The Program Office should define the scope of future development and test activities in a revised Acquisition Strategy and Test and Evaluation Master Plan.
 2. The Army should conduct adequate integrated operational flight testing prior to migrating any UH-60M Upgrade capabilities onto the UH-60M Baseline aircraft.
 3. The Army should continue activities for those items to be migrated from the UH-60M Baseline under the approved LFT&E Strategy. The Army should complete the vulnerability analysis planned for the monolithic airframe and Ballistic Armor Protection System incorporated, but not tested, under UH-60M Baseline. The laboratory evaluation of the fly-by-wire computer system needs to be performed.

Assessment

- Early reports from units receiving the UH-60M Baseline are positive and confirm DOT&E's evaluation based on operational test results that the UH-60M Baseline is effective, suitable, and survivable.
- Army pilots successfully completed 16 of 21 missions during the UH-60M Upgrade LUT in the simulator.
 - The CAAS provided enhanced navigation and situational awareness while reducing crew workload and was an